

REMARKS

Claims 1-31 remain in this application; claim 32 has been withdrawn.

The drawings stand objected to under 37 C.F.R. 1.83(a). Figures 1 and 2 have been amended to include the legend "Prior Art." As discussed below, Figure 3 shows first, second and third root radii being arranged in a pattern that substantially repeats four times around the sprocket, as claimed in claims 9 and 19.

Claims 9, 13, 17, 19 and 28 stand rejected under 35 U.S.C. 112, second paragraph. Claims 13 and 28 are amended to recite "a fourth order" instead of "the fourth order." Claim 29 is amended to correct a typographical error.

The 35 U.S.C. 112, second paragraph, rejected as applied to claims 9, 17 and 19 is respectfully transversed. The application makes clear that the phrase "substantially repeats four times" refers to patterns established on sprockets of different sizes and/or having differing total numbers of roots. Thus, depending on the sprocket design, there may be sufficient roots to permit a pattern to repeat exactly four times, while in other sprockets the pattern may repeat four times, except for the last root or roots of the pattern, which may exceed or be less than the required number for the pattern to exactly repeat.

This is discussed in the application: "[t]he root radii pattern of the sprocket 30 contains a sequence, i.e., 2, 3, 3, 2, 1, that is substantially repeated four times around the circumference of the sprocket 30." (Page 15, lines 29-32.) The pattern of radii in sprocket 30 (illustrated in Figure 3) is as follows, beginning at the timing mark T: 2, 3, 3, 2, 1, 2, 3, 3, 2, 1, 2, 3, 3, 2, 1, 2, 3, 3, 2. The sequence is repeated four times, except for the last root in the fourth sequence, i.e., 1. Thus, the applicant respectfully submits that the phrases "substantially repeats four times" are sufficiently definite for the purpose of 35 U.S.C. 112, second paragraph.

Claims 1-8, 10-18 and 20-28 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,526,558 to Durham. The applicant respectfully submits that claims 1-8, 10-18 and 20-28 are not anticipated by Durham.

Durham discloses a sprocket design intended for the sole purpose of easing the shifting of a bicycle chain between a small diameter sprocket and a larger diameter sprocket. To do so, Durham uses a random root pattern, i.e., a combination of very deep

chain slots 15, a shallow chain engagement slot 17 and a corresponding tooth pattern. Durham does not disclose or suggest a non-random root pattern for redistributing or distributing chain tension forces, or any pattern capable of reducing the overall chain tension force.

As discussed in the application, random root patterns do not provide the benefits of the claimed invention which are illustrated by empirical data set forth in the application. In examples 1 and 2, and Figures 5-7, the application describes a comparison of corresponding chain tensions between a prior art random sprocket and one aspect of a sprocket having a root radii pattern selected to redistribute tensions among the sprocket orders. Figure 5 of the application shows that, for this particular example of a random sprocket, increased chain tensions exist in the first, second, third and fourth orders as compared to the remaining orders. (See page 12, lines 30-35.) In contrast, the specially-configured sprocket, which is an example of the sprockets in accordance with the claimed inventions, is predicted in Figure 6 to reduce the chain tensions corresponding to the first three orders, and redistribute these tensions from the lower orders to the fourth order. (See page 17, lines 16-24.) Additional empirical data in Figure 7 supports the difference between random sprockets and the claimed sprockets of the present application. Figure 7 illustrates that a sprocket designed in accordance with the claimed inventions is expected to advantageously reduce the maximum overall chain tensions at a particular engine speed. (See page 18, lines 19-23.)

Durham does not disclose first and second root radii arranged in a pattern effective to redistribute tensions imparted to the chain, as recited in independent claim 1 and by dependency in claims 2-8. With respect to independent claim 20, and by dependency claims 21-26, Durham does not disclose arranging root radii between adjacent sprocket teeth in a pattern effective to distribute the tensions imparted to the chain and sprocket system reducing the overall tension force applied to the system. Durham also does not disclose having first, second and third root radii arranged in a pattern effective to redistribute tensions imparted to the chain and reduce tension force exerted on the chain during operation of the system, as presently recited in independent claim 29 and by dependency in claim 30.

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With respect to claim 10, and by dependency claims 11-18, Durham does not disclose a plurality of different root radii arranged in a pattern effective to distribute the tensions imparted to the chain at one or more preselected orders relative to the rotation of the sprocket. With respect to claim 27, and by dependency claim 28, Durham does not disclose means for concentrating the tensions imparted to the chain by the sprocket at or more predetermined sprocket orders. Moreover, there is no disclosure in Durham of taking advantage of sprocket orders for distributing tensions imparted to the chain, as does the sprocket recited in claim 10.

The Office Action states that, with respect to claims 2, 4-7, 12-15 and 21-28, there is reason to believe that, based on an alleged similarity of material and structure, the functional limitations of tensions imparted to the chain by the sprockets of Durham may be an inherent characteristic. As discussed above, the advantages of the sprockets claimed in the present application are not inherent characteristics of random sprockets, and there is no disclosure or suggestion of such characteristics in Durham's random sprocket.

Claims 1-8, 10-18, 20-29 and 31 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,155,943 to Ledvina et al. The applicant respectfully submits that claims 1-8, 10-18, 20-29 and 31 are not anticipated by Ledvina.

Ledvina discloses a sprocket having randomly arranged root radii. "Randomly arranged" is described as meaning "that the pattern is staggered between first and second radii, and not a pure alternating pattern between first and second radii." (Col. 2, ll. 33-36.) The pattern is also described as varying "irregularly around the sprocket." (Col. 4, ll. 25-26.) The random distribution of root radii in Ledvina is not described as being in any particular pattern, and simply lacks disclosure of distributing or redistributing tensions. Random sprockets, as discussed above with respect to Durham, are simply different from inventions recited in claims 1-8, 10-18, 20-29, and also with respect to claim 31.

Claims 9 and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over either Durham or Ledvina. Given the above discussions of Durham and Ledvina with respect to claims 1 and 10, it is respectfully submitted that claims 9 and 19 are not unpatentable over either Durham or Ledvina.

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For the reasons set forth above, claims 1-31 are believed to be allowable, and reconsideration and allowance of claims 1-31 are respectfully requested.

Respectfully submitted,

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